CHAPTER 8. AIRSPACE EVALUATION

800. GENERAL. The FAA conducts aeronautical studies of objects affecting navigable airspace. The obstruction evaluation program is administered by Air Traffic personnel with the coordinated assistance of Airports, AF, AVN, Military and FS personnel. The guidelines, procedures and standards for this process are established by Title 14, Code of Federal Regulations (CFR) Part 77. Title 49, Section 44718, provides the authority for these regulations and procedures.

801. PART 77. Part 77 establishes the standards for determining obstructions in navigable airspace. It requires notification to the FAA Administrator of proposed construction or alteration affecting the navigable airspace. Aeronautical evaluations are conducted to determine the effect of the construction on flight procedures, airport surfaces, and navigational aids and may include public hearings on the effect of the proposed construction on air navigation.

a. The authority to conduct aeronautical studies of objects affecting navigable airspace is delegated to the regional offices. The program is administered by regional AT personnel. The FMO shall evaluate the aeronautical effect from electromagnetic radiation and possible interference to both ground facilities and aircraft. The results of this evaluation will be submitted to AT. Similar studies shall be conducted by Airports, FS, AVN, Military and other parts of AF. The sum of all these evaluations, plus any public comment, will be coordinated into the final determination.

b. Part 77 requires that sponsors of construction or alteration projects file notice with the FAA if their projects meet or exceed the following criteria in addition to physical height and location criteria contained in Part 77.

(1) Any construction or alteration of a radio frequency transmitting station with an operating frequency above 30 MHz and an effective radiated power (ERP) above 10 kilowatts (kW) that has its antenna physically located below the airport imaginary surfaces applicable to the airport concerned.

(2) Any initial or modified operation of a transmitting station, including a change in authorized frequency or ERP within 3,000' of an aeronautical navigation aid or communications site.

(3) Any construction of a new FM or VHF-TV station utilizing an existing antenna tower.

(4) Any alteration, including changes in authorized frequency, effective radiated power, antenna height and antenna type of existing FM and VHF-TV stations.

802. Title 49, Section 44718. By regulation or order when necessary, the Secretary of Transportation shall require a person give adequate public notice, in the form and way the Secretary prescribes, of the construction of any structure or landfill that may result in an obstruction of the navigable airspace or an interference with air navigation facilities and

equipment or navigable airspace. An aeronautical study shall be conducted to determine the extent of the adverse impact, if any, on the safe and efficient use of such airspace, facilities or equipment. It also provides for aeronautical studies regarding an existing object. The regional FMO shall evaluate these cases for hazardous electromagnetic effect in the same manner described in paragraph 801a.

a. Aeronautical studies conducted under Title 14, Section 44718 will be handled directly with the proponent by AT, who will keep ASR and the FCC informed of all action.

b. Each region is provided a listing of applications for FCC amplitude modulation (AM), frequency Modulation (FM) and television (TV) Broadcast (BC) Construction Permits (CP) and licenses on a regular basis. This list originates in the FCC and is distributed by ASR. Should the Regional FMO note an applicant listed that requires study, the FMO shall notify ASR by telephone. ASR will then request the FCC to hold further processing of the application until a regional study is complete. The results of this study will be provided to the applicant, the FCC, and ASR by the regional FMO in a timely manner.

803. WASHINGTON HEADQUARTERS REVIEWS. The sponsor of any proposed construction or alteration, or any person who stated a substantive aeronautical comment on a proposal in an aeronautical study may petition the Administrator for a discretionary review of a determination, revision or extension of a determination issued by regional AT. The authority to grant a review is delegated to the Program Director of Air Traffic, ATA-1. Such petitions are processed and coordinated by the Airspace and Rules Division, ATA-400. Once granted, discretionary review is conducted by the various Washington Headquarters services in the same manner as the original regional evaluation. Based upon review, analysis and evaluation of the region's report of the aeronautical study, briefs and related submissions by any interested party, AT prepares a notice affirming, revising, or reversing the original determination for ATA-1's signature.

804. ELECTROMAGNETIC EVALUATION. The electromagnetic evaluation of a proposed construction or alteration must be detailed and consistent. Particular attention should be given to high power AM, FM, and TV broadcast proponents.

a. The evaluation should begin by gathering all pertinent data required. Through the use of various programs and on-line data bases available in the AFM, a listing of all ground aeronautical receivers and transmitters and all commercial broadcast transmitters should be compiled. This list must include frequency, geographic coordinates, emitter effective radiated power (ERP) and elevations. The proposed construction is then plotted on either a sectional or terminal aeronautical chart, whichever is most appropriate. Considerations must be given to overall terrain height, antenna height, and the proximity of any existing commercial transmitters.

b. When plotting the chart, locations of Instrument Landing System (ILS) "keyhole," ESV's, Markers, VHF Omnidirectional Radio Range (VOR), and COMM facilities should be noted. In some cases, facilities within a 30 nautical mile (nmi) radius of the proposed site may need to be accounted for.

c. An intermodulation (intermod or IM) study utilizing the frequencies compiled is the

next step. The study should include at least third order calculations. If hazardous intermod products result, the Venn diagram procedure detailed in the appendix of this order must be used to determine where it exists for all situations except those involving FM broadcast stations to ILS localizers and VOR's. The predicted area of intermod must fall in the frequency protected service volume (FPSV) for a hazard to exist.

d. Brute force for COMM facilities is also calculated using the Venn diagram method. If an aircraft enters this area, the broadband RF section of the receiver will be driven into nonlinearity regardless of transmitted frequency and desensitization will result.

e. The Airspace Analysis Mathematical model (AAM) will be used to evaluate the effects of FM broadcast signals on ILS localizer, VOR and COMM signals received by airborne receivers, as well as by ground receivers in the case of COMM. This includes IM, receiver front-end overload and adjacent channel interference.

f. Signal levels at the input of FAA ground receivers should be calculated for both out-of-band and in-band (spurious) signals.

g. A very important part of this entire evaluation is a vertical profile plot of the proposed site and affected facilities. In many cases, it will be necessary for the FMO to obtain the antenna radiation patterns (horizontal and vertical) from the proponent. All calculations are based on an isotropic radiator. Use of the actual antenna radiation pattern provides a more realistic evaluation.

h. The complete and detailed procedure for an airspace evaluation is contained in the appendix of this order along with several examples.

805. AAM. The AAM was designed to assist the FMO in determining the effects of various radio frequency emitters on aircraft NAV and COMM facilities. The model determines the effects of FM broadcast stations on an ILS localizer and VOR. It allows the selection of a proponent FM station at any location within the U.S. and provides a complete compatibility analysis between the proponent and any selected localizer within 30 nmi of the proponent.

a. The AAM computes the boundaries of a three-dimensional service volume for the specified facility. It then generates a test grid inside the service volume at specified horizontal and vertical increments. The field strength for the proponent station is computed at each point on this grid and compared to threshold criteria that have been shown in bench measurements to cause brute force interference in typical receivers. All possible 2- and 3-frequency third order IM products involving the proponent and other transmitters are computed and the combined field strength of the stations contributing to each product is compared to other threshold criteria.

b. The output of the AAM is a series of plot files of predicted interference points within the designated service volumes. The files may be plotted to a terminal screen, a printer or a plotter. The AAM will also indicate if no interference potential exists. A complete technical description of the AAM is contained in the "Technical Reference Guide to the Airspace Analysis Model," available from ASR.

806. DETERMINATIONS. After the engineering evaluation has been performed, it is necessary to determine whether the predicted interference (if any) is a hazard to air navigation.

a. In a 1985 letter from the Chairman of the FCC to the Administrator of the FAA, it was agreed that in certain situations where there is insufficient scientific information upon which to make a conclusive determination, that certain limiting conditions would be added directly to new or modified station authorizations. These limiting conditions which are set forth in the "conditional statement" are as follows:

> "Upon receipt of notification from the Federal Communications Commission that harmful interference is being caused by the licensee's (permittee's) transmitter, the licensee (permittee) shall either immediately reduce the power to the point of no interference, cease operation or take such immediate corrective action as is necessary to eliminate the harmful interference. This condition expires after 1 year of interference-free operation."

b. This includes the following situations:

(1) VHF-TV broadcast proponents which appear to be a hazard based on the current electromagnetic interference prediction data and methods.

(2) FM broadcast proponents proposing to relocate and/or modify an existing FM station resulting in an equal or lesser interference problem than presently exists. This can include a change in location, power, frequency, antenna height or antenna type.

(3) Interference is predicted in an area inside the service volume where an aircraft cannot possibly fly due to terrain or physical obstructions.

807. NON FM BROADCAST EVALUATIONS. There are special considerations given to certain non-broadcast transmitters. These procedures are covered under a joint public notice issued by FAA and FCC and a joint agency policy for AF and AT. The public notice is quoted verbatim as subparagraph a, below. The agency policy is summarized in subparagraph b, below.

a. Joint FAA/FCC public notice:

The Federal Aviation Administration (FAA) and the Federal Communications Commission (FCC) have reached an agreement to simplify the handling of electromagnetic interference (EMI) issues with respect to AM broadcast stations, fixed microwave transmitters, and cellular radiotelephone fixed transmitters. The FAA's concern in this area arises from the possibility that such transmitters might be installed too close to remotely controlled aeronautical receivers so as to disrupt air traffic control communications and navigational aids.

It has been agreed that the FAA will not issue a hazard determination to those applicants for licenses involving cellular fixed transmitters, fixed microwave transmitter, or AM broadcast transmitters that invite potential EMI, nor, will the FAA request the applicants to use filtering beyond what is normally required by FCC rules. Rather, the FAA will include the following language in a Determination of No Hazard, assuming that physical obstruction is not an issue.

> FAA facilities critical to aviation safety are located (distance) from your proposed transmitter site. You may cause harmful interference to these facilities if your equipment meets only minimum FCC standards for spurious emissions. Before you begin any transmission from your facility, contact (name and phone number of local FAA contact) to arrange procedures to verify that no interference is caused.
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> FCC requirements in:
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> | 47 CFR 73.44 (c) | (in the case of AM broadcast stations) |
> | 47 CFR 22.907 (c) | (in the case of fixed cellular transmitters) |
> | 47 CFR 21.106 (c) | (in the case of common carrier fixed microwave transmitters) |
> | 47 CFR 74.23 (a) | (in the case of broadcast auxiliary transmitters) |
> | 47 CFR 94.71 (d) | (in the case of operational fixed service transmitters) |
>
> indicate that the licensees may need to employ extra filtering or take other measures if their transmissions disrupt other services. The commission requires its licensees to cooperate fully with other Federal agencies (users in other services) in this case the FAA, to eliminate any harmful interference covered by the above requirements.

This agreement does not affect the requirement of an FCC applicant to notify the FAA of proposed construction or modification of towers under existing FAA and FCC rules. Facilities located near airports raise concerns about possible interference to aircraft and will be handled under existing procedures.

This agreement should speed the authorization of service for licensees in the above categories. Both agencies agree that this special case of potential interference to ground based receivers from transmitters at widely differing frequencies can be adequately handled by requiring the licensee (applicant) to shut down if EMI is present due to the use of the transmitter.

b. The policy for use of the new statement for AM BC, cellular and microwave transmitters which are a potential for electromagnetic interference (EMI) is as follows:

(1) The FMO shall not issue a Determination of Hazard when an AM BC, cellular or microwave transmitter evaluation indicates the possibility of EMI to an FAA facility.

(2) The current procedures for determining whether the proposed facility will exceed the limits of -4 dBm for out-of-band or -104 dBm for in-band shall be used for evaluation.

(3) If no problem is predicted, the FMO shall so notify the regional AT entity involved.

(4) If a problem is predicted, however, instead of either recommending a hazard be written or telling the proponent that additional attenuation will be required, AT will be provided with the name of the regional FMO whom the proponent must contact to arrange procedures to verify that no interference is caused. This initial verification is done during the Construction Permit (CP) phase of the FCC licensing process. FCC rules require that during this period, all interference must be eliminated before the applicant can receive a transmitting license.

(5) Upon notification by the proponent of the intent to turn on a new transmitter, the regional FMO will contact the SMO that is responsible for the facility where the problem has been predicted. The following is the required procedure:

(a) The SMO will coordinate the turn-on for testing of the new facility with the proponent to ensure that all FAA personnel are aware of the existence of the new potential for interference and make whatever arrangements they feel are necessary to adequately monitor any suspected EMI to FAA equipment.

(b) These arrangements can include having a technician at the site to monitor the equipment, advising AT of the potential for interference and to be aware of it, or even simply noting the new facility in case interference is reported in normal day-to-day operations.

(c) If interference is detected, the SMO will immediately notify the proponent, who will shut down the interfering transmitter. The SMO will also notify the regional FMO who in turn will contact the local FCC office.

(d) The FCC will, at this point, use their own existing procedures to bring the proponent into compliance with the applicable FCC requirements.

(e) Only in the rarest situations would a proposal be submitted for one of these services at a location that could endanger FAA facilities. Such a condition (such as a high power AM BC transmitter located in close proximity to an airport or navigational aid) would be so obvious to the reviewing official that it would be accorded special attention beyond the requirements of the notice.

808. thru 899. RESERVED.